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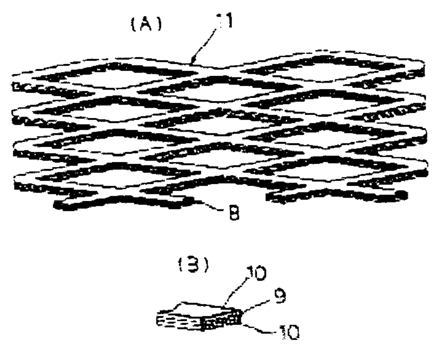
(54) [Title of the Invention] Reinforcing Material for Urethane Foam Molding

(57) [Summary]

[Object] To obtain a seat or other article for use in vehicles that has an excellent reinforcing effect, does not cause expanded urethane to leak to the surface and form a cured product during

molding, can prevent abnormal noise from being generated by the friction between cured urethane foam and springs, has excellent stiffness and durability, and is comfortable to sit in.

[Structure] A reinforcing material for urethane molding, characterized in that a reticulated base layer, and more preferably a reticulated base layer obtained by the longitudinal and latitudinal lamination of split webs and slit webs, is formed as an intermediate layer between top and bottom nonwoven fabric layers or as one of the nonwoven fabric layers; and the product is integrated by needle punching.



[Claims]

[Claim 1] A reinforcing material for urethane foam molding, characterized in that at least one nonwoven fabric layer and a reticulated base layer are rendered gas permeable and integrated by needle punching, thermal lamination, striping lamination, or kilting.

[Claim 2] The reinforcing material for urethane foam molding according to claim 1, characterized in that the reticulated base layer is formed from a reticulated base material obtained by a process in which a uniaxially oriented body formed from a thermoplastic resin film is longitudinally and latitudinally laminated or woven such that the orientation axes thereof intersect each other.

[Claim 3] The reinforcing material for urethane foam molding according to claim 1 or 2, characterized in that the basis weight of the nonwoven fabric layer falls within a range of 20 to 120 g/m^2.

[Claim 4] The reinforcing material for urethane foam molding according to any of claims 1 to 3, characterized in that the nonwoven fabric layer has a fineness of 1 to 5 denier.

[Claim 5] The reinforcing material for urethane foam molding according to any of claims 1 to 4, characterized in that the reticulated base layer is disposed between two nonwoven fabric layers.
[Claim 6] The reinforcing material for urethane foam molding according to any of claims 1 to 4, characterized in that the reticulated base layer is the closest to the urethane side.

[Detailed Description of the Invention]

[0001]

[Technological Field of the Invention] The present invention relates to a reinforcing material for urethane foam molding, and more particularly to a reinforcing material for urethane foam molding that can endow the surface structure of a foam molding with adequate stiffness and that prevents expanded urethane from leaking to the surface of the molded product during molding, and abnormal noise from being generated during friction with the frame, springs, and other metal parts when used, for example, as the reinforcing material of a seat cushioning material.

[0002]

[Prior Art] In soft polyurethane and other expanded molded articles used as the cushioning materials in automobile seats or the like, a reinforcing material 2 is attached to the bottom portion of a urethane layer 3 to ensure stiffness and to provide tension to the cushioning properties while preventing the layer from being damaged by the pressure of the coil springs 1 or other components attached to the bottom portion, as shown, for example, in Fig. 1. In conventional practice, such a reinforcing material 2 is obtained by a process in which slab urethane is placed on the wall surface of a foaming kettle, cheesecloth is placed on the inside thereof, a urethane solution is injected, and foam molding is performed by the application of heat and pressure.

[0003] To compensate for the stiffness insufficiency or the like in this method, it has been proposed (Japanese Utility Model Publication No. 62-26193) to use a reinforcing base fabric for urethane foam molding that comprises a nonwoven fabric obtained by integrating a thin dense layer with a basis weight of 10 to 30 g/m^2 and a coarse bulky layer with a basis weight of 40 to 100 g/m^2, to use a heavy nonwoven fabric (Japanese Patent Application Laid-open No. 2-258332) with a basis weight of 110 to 800 g/m^2 and a fineness of 1 to 16 denier, to use a reinforcing material for foam molding (Japanese Patent Application Laid-open No. 4-141405)

that has a base layer comprising a heavy nonwoven fabric such as the one described above and a reinforcing coating layer comprising a fiber aggregate or the like on one side thereof, to use the same reinforcing material (Japanese Patent Application Laid-open No. 5-57827) that has a base layer composed of a heavy nonwoven fabric and a reinforcing coating layer comprising a light nonwoven fabric, or to use a reinforcing material (Japanese Patent Application Laid-open No. 6-136651) that comprises a bulky base layer with a fineness of 2 to 20 denier and a thin dense nonwoven fabric with a fineness of 2 to 10 denier. The object of these inventions is to prevent abnormal noise from being generated by the friction between, among other things, holding fixtures and cured resin solutions for foam molding that have leaked and cured on the surface of the reinforcing material. Methods performed using reinforcing materials obtained by laminating such nonwoven fabrics are disadvantageous, however, in that the reinforcing effect is sometimes inadequate, considerable thickness results because of the lamination of bulky nonwoven fabric, and other problems are encountered.

[0004] To prevent a cured resin that has been leaked by the aforementioned reinforcing material from generating noise through friction with seat frames or the like, it has also been proposed to use a method (Japanese Patent Application Laid-open No. 5-138782) in which a gas-impermeable plastic film is bonded to coarse felt or the like to block the passage of starting materials for foaming, or a method (Japanese Patent Application Laid-open No. –8337)[1] that features a composite sheet comprising a resin adhesive layer, a woven fabric comprising polyester fibers, and an elastomer film comprising an ethylene-acrylic acid copolymer or the like. However, these methods are disadvantageous in that, in addition to impeded gas permeability, penetration of resin solution into the nonwoven fabric layer is inhibited as well, making it impossible to ensure adequate stiffness without impregnating the nonwoven fabric layer (reinforcing layer) with the resin solution, and hence reducing the functionality of the product as a reinforcing material and bringing about other drawbacks.

[0005] There is also a reinforcing material for urethane foam molding with a basis weight of 20 to 200 g/m^2, obtained by arranging fibers in an orthogonal manner in a polyethylene terephthalate long-fiber nonwoven fabric with a fineness 5 to 25 denier under specific conditions (Japanese Patent Application Laid-open No. 7-228709). It is pointed out in this invention that if the fineness is less than 5 denier, the density of the long-fiber nonwoven fabric increases, gas

removal is adversely affected during polyurethane foaming, the polyurethane resin becomes incapable of adequately penetrating into the long-fiber nonwoven fabric, and other problems are encountered.

[0006] To improve urethane blocking properties, abnormal noise prevention, and moldability, it has also been proposed to use a method in which bulky nonwoven fabric layers and dense nonwoven fabric layers are laminated and integrated as top and bottom layers and intermediate layers, respectively (Japanese Patent Application Laid-open No. 6-171003), and a method in which the layer in contact with expanded urethane are used as the dense nonwoven fabric layer, and the layer in contact with coil springs or the like is used as the bulky nonwoven fabric layer (Japanese Patent Application Laid-open No. 6-171002). In these methods, nonwoven fabrics with basis weights of 20 to 100 g/m^2 and 30 to 200 g/m^2 are used separately as nonwoven fabrics with porosities of 87 to 91% and 90 to 94%.

[0007]

[Problems Which the Invention Is Intended to Solve] An object of the present invention is to ensure stiffness and to provide tension to the cushioning properties while avoiding damage from coil springs and other components attached to the bottom portion, which is an inherent drawback of reinforcing materials for urethane foam molding when they are used, for example, as cushioning materials for automobile seats or the like; and to provide a high-strength reinforcing material for urethane foam molding that is effective in preventing blockage of air vents in the molds during urethane foam molding (a problem that required resolution in the conventional methods described above) and that is devoid of the problem whereby abnormal noise is generated by friction with cured urethane on the surface of the reinforcing material in contact with springs or other metal parts.

[0008]

[Means Used to Solve the Above-Mentioned Problems] Specifically, the present invention provides a reinforcing material for urethane foam molding characterized in that at least one nonwoven fabric layer and a reticulated base layer are rendered gas permeable and integrated by needle punching, thermal lamination, striping lamination, or kilting.

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[1] Translator's note: This patent document number appears to be incomplete.

[0009] In the present invention, the reticulated base layer is preferably formed from a reticulated base material obtained by a process in which a uniaxially oriented body formed from a thermoplastic resin film is longitudinally and latitudinally laminated or woven such that the orientation axes thereof intersect each other.

[0010] It is also preferable that the basis weight of the nonwoven fabric layer fall within a range of 20 to 120 g/m^2 and that the nonwoven fabric layer be formed from fibers with a fineness of 1 to 5 deniers.

[0011] It is further preferable that the reticulated base layer be disposed between two nonwoven fabric layers and that the reticulated base layer be the closest to the urethane side.

[0012]

[Embodiments of the Invention] Fig. 2 is a diagram depicting a urethane foam molding obtained using a reinforcing material 2a for urethane foam molding manufactured in accordance with the present invention and provided with a three-layer structure. In Fig. 2, 3 is a molded urethane layer, 5a and 5a' are nonwoven fabric layers, and 4a is a reticulated base layer disposed between the nonwoven fabric layers 5a and 5a'. Fig. 3 is a diagram depicting a urethane foam molding obtained using a reinforcing material 2b for urethane foam molding manufactured in accordance with the present invention and provided with a two-layer structure. In Fig. 3, 3 is a molded urethane layer, 5b is a nonwoven fabric layer, and 4b is a reticulated base layer disposed on the side of the urethane layer 3.

[0013] Synthetic fiber (polypropylene, polyester, high-density polyethylene, low-density polyethylene, nylon, or the like), regenerated fiber (rayon or the like), natural fiber (cotton or the like), or a fiber obtained by compounding the above fibers may be used as the material for the nonwoven fabric layers 5a and 5a'. Among these fibers, polyester fiber is particularly useful.

[0014] The reticulated base layers 4a and 4b are formed from a reticulated base material obtained by a process in which a uniaxially oriented body formed from a thermoplastic resin film is longitudinally and latitudinally laminated or woven such that the orientation axes thereof intersect each other. Specifically, it is possible to use a nonwoven fabric or woven fabric that has an excellent reinforcing effect and is obtained by a process in which at least one uniaxially oriented thermoplastic resin body selected from a split web, slit web, and uniaxially oriented tape is longitudinally and latitudinally laminated or structured such that the orientation axes thereof

intersect each other. Since a uniaxially oriented body composed of a film is flat, the reinforcing material of the present invention can be made thin and smooth.

[0015] The split web may have a single layer, but is preferably a uniaxially oriented reticulated film obtained by a process in which a multilayer film with at least two layers fabricated by multilayer inflation, a multilayer T-die process, or another type of extrusion molding is drawn in the longitudinal direction (length direction) or transverse direction (width direction), and numerous cracks are introduced in a discontinuous manner in the drawing direction. The slit web is a uniaxially oriented reticulated film obtained by a process in which the aforementioned monolayer or multilayer film is provided with numerous slits (cracks) in the longitudinal or transverse direction, and is then drawn in the slit direction. The uniaxially oriented tape is obtained by uniaxially drawing the aforementioned monolayer or multilayer film in the transverse direction before and/or after cutting.

[0016] Specific examples of reticulated base layers 4a and 4b composed of the aforementioned uniaxially oriented body include nonwoven fabrics obtained by the longitudinal and latitudinal lamination and thermocompression bonding of a slit web, nonwoven fabrics obtained by the longitudinal and latitudinal lamination and thermocompression bonding of a slit web,[2] nonwoven fabrics obtained by the longitudinal and latitudinal lamination and thermocompression bonding of a split web and a slit web, nonwoven fabrics obtained by the longitudinal and latitudinal lamination of a split or slit web and a uniaxially oriented tape in a manner such that the orientation axes thereof intersect each other, and woven fabrics obtained by weaving a uniaxially oriented tape.

[0017] A product obtained by longitudinally and latitudinally laminating at least one type of uniaxially oriented body selected from a split web, slit web, and uniaxially oriented tape in the above-described manner (such that the orientation axes intersect each other) is preferred as the nonwoven fabric composed of a uniaxially oriented body. Depending on the application, however, it is possible to laminate the elements with a random or unidirectional orientation. These nonwoven and woven fabrics may also be subjected to composite lamination before being used.

[0018] The uniaxially oriented body should be a multilayer drawn body in which a layer of a second thermoplastic resin whose melting point is lower than that of a first crystalline

thermoplastic resin is formed as an adhesive layer on at least one side of a layer composed of the first thermoplastic resin.

[0019] Examples of the first thermoplastic resin include high-density and medium-density polyethylene, polypropylene, polybutene–1, poly–4–methylpentene–1, polyhexene–1, and other α–olefin homopolymers; polyolefins such as propylene-ethylene copolymers and other α–olefin copolymers; polyamides; polyesters; polycarbonates; and polyvinyl alcohols.

[0020] Examples of a second thermoplastic resin whose melting point is lower than that of the first thermoplastic resin include high-, medium-, and low-density polyethylene; linear low-density polyethylene; extra-low-density polyethylene; ethylene-vinyl acetate copolymers; ethylene-acrylic acid copolymers; ethylene-methacrylic acid copolymers; ethylene-ethyl acrylate copolymers and other ethylene-acrylic acid esters copolymers; ethylene-methacrylic acid ester copolymers and other ethylene-methacrylic acid ester copolymers; ethylene-maleic acid copolymers and ethylene-maleic acid ester copolymers; polypropylene, propylene-ethylene copolymers, and other propylene-based polymers; and polyolefins modified by unsaturated carboxylic acid. It is also possible to use mixtures of these resins with other polyolefin-based resins, such as products obtained by admixing high-density polyethylene, an ethylene-α-olefin copolymer, or other polyethylene-based resin into a random copolymer of propylene and ethylene, 1-butene, or the like.

[0021] Because of manufacturing considerations, and to prevent the strength enhanced by the drawing or calendering of the uniaxially oriented body from being reduced, the difference in the melting point between the second thermoplastic resin and the first thermoplastic resin is preferably at least 5°C, and is more preferably within a range of 10 to 50°C.

[0022] Specific examples of resin structures for the multilayer film include high-density polyethylene (HDPE)/low-density polyethylene (LDPE), LDPE/HDPE/LDPE, HDPE/ethylene-vinyl acetate copolymer (EVA), EVA/HDPE/EVA, polypropylene (PP)/propylene-ethylene copolymer (PEC), PEC/PP/PEC, polyester (PEs)/copolymer polyester (CPEs), and CPEs/PEs/CPEs.

[0023] A specific example of the method for manufacturing a split web and a slit web will now be described with reference to drawings.

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[2] Translator's note: Possible misprint for "split web."

[0024] Fig. 4(A) is a fragmentary expanded perspective view depicting an example of a split web obtained by uniaxial drawing and cutting in the longitudinal direction. The split web 6, for which a thermoplastic resin is used as a starting material, is a product obtained by a process in which a multilayer film with at least two layers (itself fabricated by multilayer inflation, a multilayer T-die process, or another type of extrusion molding that involves a first thermoplastic resin and a second thermoplastic resin whose melting point is lower than that of the first thermoplastic resin) is drawn in a draw ratio of 1.1 to 15, and preferably 3 to 10, in the longitudinal direction (length direction), and is then cut (split) with the aid of a splitter in the same direction in a cross-stitch configuration. The multilayer film is thereby configured into a reticulated structure, and a split web 6 in the form of a net results from stretching the film to a specific width. The split web 6 is a uniaxially oriented body that has strength in the longitudinal direction along the entire width direction. In the drawing, 7 is a trunk fiber, and 8 is a branch fiber.

[0025] Fig. 4(B) is a fragmentary expanded perspective view of part B in Fig. 4(A). The split web 6 has a three-layer structure in which the second thermoplastic resin 10 is laminated on both sides of the first thermoplastic resin 9.

[0026] Fig. 5(A) is a fragmentary expanded perspective view depicting an example of a slit web obtained by a process in which numerous slits are introduced into a film in the transverse direction, and the slit product is then uniaxially drawn in the transverse direction. The slit web 11, for which a thermoplastic resin is used as a starting material, is a uniaxially oriented body obtained by a process in which staggered or otherwise discontinuous parallel slits are formed with the aid of, for example, a hot blade in the multilayer film in the transverse direction (width direction) everywhere except in the two corner portions, and the product is then drawn in a draw ratio of 1.1 to 15, and preferably 3 to 10. This body has strength in the transverse direction. In preferred practice, the multilayer film is slightly oriented by calendering or the like in a ratio of about 1.1 to 3 in the longitudinal direction, slitted in a cross-stitch configuration with a hot blade in the transverse direction, and transversely drawn.

[0027] Fig. 5(B) is a fragmentary expanded perspective view of part B in Fig. 5(A). The split web 11 has a three-layer structure in which the second thermoplastic resin 10 is laminated on both sides of the first thermoplastic resin 9.

[0028] Fig. 6 is a fragmentary expanded perspective view of a uniaxially oriented tape. The uniaxially oriented tape 12, for which a thermoplastic resin is used as a starting material, is a multilayer drawn tape obtained by a process in which a multilayer film with at least two layers (itself fabricated by multilayer inflation, a multilayer T-die process, or another type of extrusion molding that involves a first thermoplastic resin and a second thermoplastic resin whose melting point is lower than that of the first thermoplastic resin) is uniaxially drawn in a draw ratio of 1.1 to 15, and preferably 3 to 10, in the longitudinal direction and/or transverse direction before and/or after cutting, and the drawn film is then cut.

[0029] The uniaxially oriented tape 12 has a three-layer structure in which the second thermoplastic resin 10 is laminated on both sides of the first thermoplastic resin 9 in the same manner as above.

[0030] Figs. 7–9 show specific examples of the reticulated base layers 4a and 4b in accordance with the present invention. Fig. 7 is a fragmentary plan view of a reticulated base material 8 obtained by longitudinally and latitudinally laminating the split web 6 and slit web 11 in a manner such that the orientation axes thereof intersect each other. Fig. 8 is a fragmentary plan view of a reticulated base material 13 obtained by longitudinally and latitudinally laminating two split webs 6 in a manner such that the orientation axes thereof intersect each other.

[0031] Fig. 9 is a fragmentary plan view of a reticulated base material 14 obtained by longitudinally and latitudinally laminating two groups of parallelly aligned uniaxially oriented multilayer tapes 12 in a manner such that the orientation axes thereof intersect each other, and Fig. 10 is a fragmentary plan view of a reticulated base material 15 obtained weaving the uniaxially multilayer oriented tapes 12.

[0032] The above-described split web/slit web type of laminated and reticulated base material 8, split web/slit web type of laminated and reticulated base material 13, uniaxially oriented multilayer tape type of laminated and reticulated base material 14, and uniaxially oriented laminated tape type of woven and reticulated base material 15 can be used as products obtained by further laminating pairs of reticulated base materials of the same type.

[0033] Nisseki Warifu (registered trade name of a product manufactured by Nisseki Plast) can be cited as an example of a split web/slit web type of laminated and reticulated base material 8 or split web/slit web type of laminated and reticulated base material 13. Urethane foam molding will now be described in brief.

[0034] In the present invention, polyurethane foam is a foam made from diisocyanate and polyols. Examples of suitable diisocyanates include *m*-phenylene diisocyanates, toluene – 2,4 – diisocyanate, hexamethylene – 1,6 – diisocyanate, tetramethylene – 1,4 – diisocyanate, cyclo-hexane – 1,4 – diisocyanate, naphthalene – 1,5 – diisocyanate, 1 – methoxyphenyl – 2,4 – diiso-cyanate, diphenylmethane – 4,4' – diisocyanate, and 4,4' – biphenylene diisocyanate.

[0035] Examples of suitable polyolefins include polyoxypropylene glycol, polyoxypropylene/ polyoxyethylene glycol, and other polyether types, as well as polyester types whose principal components are condensation products of adipic acid and ethylene glycol. Among these, polyether types are preferred.

[0036] The polyurethane foam may be manufactured by so-called reaction injection molding (RIM), in which polyols such as those described above are rapidly mixed with solution A (which comprises a foaming agent, catalyst, cell size adjustor, and the like) and solution B (which comprises isocyanate and the like), and the liquid mixture is sprayed into a mold from a nozzle to produce a foam.

[0037] Examples of the methods for manufacturing the reinforcing material for urethane foam molding in accordance with the present invention include those in which a nonwoven fabric layer is laminated on one or both sides of a reticulated base layer and is endowed with gas permeability and mechanically joined or heat-treated and fused by needle punching, thermal lamination (heat treatment), striping lamination, kilting, or another common method; those (wet methods) in which base fibers are dispersed in an appropriate solvent to prepare a dispersion, this dispersion is used to prepare a pulp and to form an aggregated layer of the base fibers on the surface of a reticulated base layer, and the product is heat-treated to fuse the nonwoven fabric layer (aggregated layer of fibers) to the surface of the reticulated base layer while endowing the surface with gas permeability; and those (dry methods) in which the base fibers are deposited by spraying with air on the reticulated base layer, and the product is heat-treated to fuse the nonwoven fabric layer as a fiber aggregate to the surface of the reticulated base layer while endowing the surface with gas permeability. Examples of suitable heat treatment methods include blowing hot air, passing the material between heat sources, heating the material with infrared radiation, using a heater or the like, and using hot rolls. Among these methods, those in which needle punching is used to integrate the nonwoven fabric layers and reticulated base layer is preferred because the gases produced during urethane foam molding can be vented and the

penetration of urethane liquid controlled without any adverse effect on the gas permeability of the reinforcing material.

[0038] When a nonwoven fabric produced in advance by the above-described manufacturing methods is used for the nonwoven fabric layers, a fabric obtained using any commonly known method may be used as long as this fabric has adequate urethane blocking properties. Examples of such methods include spun bonding, needle punching, water jetting, and melt blowing.

[0039] Fig. 10[3] is an example of a typical flowchart for manufacturing the reinforcing material 2a for urethane foam molding in accordance with the present invention as a three-layered structure. Following is the description of an arrangement in which polyester fibers are used as the preferred material for forming the nonwoven fabric layers.

[0040] In Fig. 11, 16 is, for example, a raw cotton hopper for thermoplastic resin fibers, 17 is a mixing box that doubles as a starting material stocker, 18 is a pre-fibrillating opener for forming a surface nonwoven fabric layer 5a, and 19 is a pre-fibrillating opener for forming another nonwoven fabric layer 5a'. The materials pre-fibrillated in the openers 18 and 19 are homogenized in the respective carding machines 20 and 21 for fibrillation and webbing, a webbed laminate for forming the nonwoven fabric layer 5a is subsequently formed in the cross-layer forming apparatus 22 of the lower line, a webbed laminate for forming the other nonwoven fabric layer 5a' is formed in a cross-layer forming apparatus 23 from the material in the other carding machine 21, and a reticulated base material for forming a reticulated base layer 4a is fed by a reticulated base material feed roll 24 between the nonwoven fabric layer 5a and the other nonwoven fabric layer 5a'.

[0041] The nonwoven fabric layer 5a and the other nonwoven fabric layer 5a' are compressed by a press roll or other roll (not shown); the reticulated base layer 4a is interlaced by a needle punch 25 with the nonwoven fabric layer 5a', which is the webbed laminate disposed in the bottom part of the line; the reticulated base layer 4 is interlaced by a needle punch 26 with the nonwoven fabric layer 5a; and a reinforcing material 27 for urethane foam molding is formed and wound onto a winding roll 28.

[0042] Described below is a preferred embodiment of the reinforcing material 2a for urethane foam molding in accordance with the present invention.

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[3] Translator's note: Possible misprint for "Fig. 11."

[0043] The thickness of the fibers for forming the nonwoven fabric layer 5a and the other nonwoven fabric layer 5a' preferably falls within a range of between 1 denier and less than 5 denier. Among the aforementioned fiber materials, polyester fibers with a thickness of 1 to 3 deniers are the most preferred for use. Fibers whose thickness is less than 1 denier are difficult to fibrillate on a carding machine or the like, to fashion into a uniform web, or to use for other purposes, whereas fibers whose thickness is 5 deniers or greater are ineffective in preventing the urethane foam molding material from leaking on the surface in the nonwoven fabric layers 5a and 5a', and tend to ultimately make it difficult to prevent abnormal noise from being generated. The combined basis weight of the nonwoven fabric layers 5[a] and 5[a]' in the reinforcing material 2a for urethane foam molding with a three-layer structure preferably falls within a range of 20 to 120 g/m^2. The layers must have a sufficient basis weight to completely block off liquid urethane in such a manner that the urethane does not reach the mold in the case of a three-layer structure with an interposed reticulated base layer 4a. The nonwoven fabric layers 5a and 5a' may be the same or different. When the layers are different, the nonwoven fabric layer 5[a]' on the side in contact with the molded urethane layer 3 is formed from a relatively thin, dense nonwoven fabric and primarily serves to prevent the passage of liquid polyurethane, whereas the nonwoven fabric layer 5a on the side in contact with the springs 1 is formed from a relatively bulky, flexible nonwoven fabric and serves to improve the cushioning properties in addition to blocking off liquid urethane in a more complete manner.

[0044] The basis weight of the nonwoven fabric layer 5a on the side in contact with the springs in the reinforcing material 2a for urethane foam molding with a three-layer structure commonly falls within a range of 30 to 80 g/m^2. It is unsuitable for the basis weight to be less than 30 g/m^2 or greater than 80 g/m^2, because in the first case the cushioning properties deteriorate in addition to the inability of the product to adequately prevent liquid urethane from leaking, whereas in the second case the thickness decreases and the ability of the material to conform to the curved surfaces of the mold tends to be adversely affected.

[0045] The basis weight of the nonwoven fabric layer 5a' on the side in contact with the molded urethane layer 3 in the three-layer structure commonly falls within a range of 20 to 60 g/m^2. It is unsuitable for the basis weight to be less than 20 g/m^2 or greater than 60 g/m^2, because in the first case the inflow of the urethane foam molding material into the reticulated base layer 4a and nonwoven fabric layer 5a becomes excessive, and it ultimately is impossible to adequately

prevent the material from leaking to the surface of the nonwoven fabric layer 5a, whereas in the second case the thickness becomes excessive and the cost increases for some combinations with the nonwoven fabric layer 5a.

[0046] For the basis weight of the nonwoven fabric layer 5b with a two-layer structure, it is better to use a value commensurate with the combined nonwoven fabric layer 5a and nonwoven fabric layer 5[a]' in the reinforcing material 2a for urethane foam molding with a three-layer structure in order to fully satisfy the urethane blocking properties. This basis weight is commonly 50 to 120 g/m^2.

[0047] The basis weight of the reticulated base layers 4a and 4b in the three-layer structure is commonly 10 to 60 g/m^2. A basis weight of less than 10 g/m^2 tends to make it more difficult to obtain the high strength and stiffness needed in the case of a reinforcing material for urethane foam molding, whereas a basis weight greater than 60 g/m^2 tends to impair conformity to curved surfaces.

[0048] The basis weight of a nonwoven fabric layer 5 for forming a reinforcing material for urethane foam molding with a two-layer structure is commonly within a range of 30 to 100 g/m^2. It is unsuitable for the basis weight to be less than 30 g/m^2 or greater than 100 g/m^2, because the excessively low values are ineffective for preventing the urethane foam molding material from leaking, and the excessively high values tend to impair conformity to curved surfaces.

[0049]

[Embodiments] The present invention will now be described further by way of embodiments.

[0050] A nonwoven fabric layer with a basis weight of 40 g/m^2, produced by fibrillating and webbing 2-denier polyester fibers, was laminated; Nisseki Warifu HS-T (manufactured by Nisseki Plast) with a basis weight of 35 g/m^2 and a thickness of 0.1 mm, produced by the longitudinal and latitudinal lamination of a split web and a slit web, was subsequently fed as a reticulated base layer from a separate roll; a nonwoven fabric layer identical to the aforementioned nonwoven fabric layer was laminated at the same time; and the elements were interlaced and integrated by needle punching, yielding a reinforcing material for urethane foam molding with a three-layer structure.

[0051] The urethane foam molding material thus obtained was placed in a mold for foam molding such that the surface of one of the nonwoven fabric layers inside the mold faced the side

in contact with the mold, and the surface of the other nonwoven fabric layer was on the side on which a foaming urethane resin was added; the foaming urethane resin was added in the usual manner; and polyurethane was foam-molded under heat and pressure, yielding a urethane foam molding.

[0052] The penetration and transmission of polyurethane resin in the outermost nonwoven fabric layer of the resulting molding were monitored, and it was found that there was no penetration of urethane solution into the nonwoven fabric layer at all. Also, no abnormal noise was generated in model tests for generating abnormal noise in which pressure was repeatedly applied to and released from the surface of the aforementioned nonwoven fabric layer in contact with coil springs.

[0053]

[Merits of the Invention] The reinforcing material for urethane foam molding in accordance with the present invention is thin and smooth, has an excellent reinforcing effect, does not cause expanded urethane to leak to the surface and form a cured product during molding, and can prevent abnormal noise from being generated by the friction between cured urethane foam and springs, making it possible to obtain a seat or other article for use in vehicles that has excellent stiffness and durability and is comfortable to sit in.

[Brief Description of the Drawings]

[Figure 1] A diagram depicting an example of a car seat.

[Figure 2] A cross-sectional view depicting an example of a urethane foam molding obtained using a reinforcing material for urethane foam molding with a three-layer structure.

[Figure 3] A cross-sectional view depicting an example of a urethane foam molding obtained using a reinforcing material for urethane foam molding with a two-layer structure.

[Figure 4] A diagram and a fragmentary expanded perspective view depicting an example of a split web.

[Figure 5] A diagram and a fragmentary expanded perspective view depicting an example of a slit web.

[Figure 6] A fragmentary expanded perspective view depicting a uniaxially oriented tape.

[Figure 7] A fragmentary expanded perspective view of a reticulated base material obtained by laminating a split web and a slit web.

[Figure 8] A fragmentary plan view of a reticulated base material obtained by laminating two split webs.

[Figure 9] A reticulated base material obtained by laminating uniaxially oriented multilayer tapes.

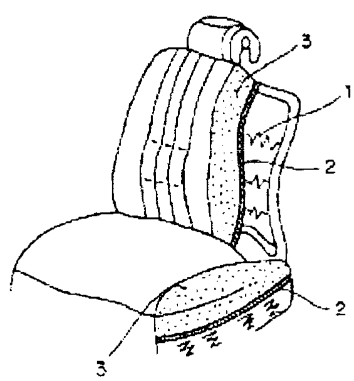
[Figure 10] A reticulated base material obtained by weaving uniaxially oriented multilayer tapes.

[Figure 11] An example of the flowsheet for manufacturing the reinforcing material for urethane foam molding in accordance with the present invention.

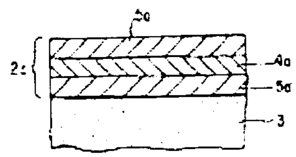
[Key]

1: coil spring; 2a, 2b: reinforcing materials; 3: molded urethane layer; 4a, 4b: reticulated base layers; 5a, 5a', 5b: nonwoven fabric layers; 6: split web; 7: trunk fiber; 8: branch fiber; 9: first thermoplastic resin; 10: second thermoplastic resin; 11: slit web; 12: uniaxially oriented tape; 13: split web/slit web type of laminated and reticulated base material; 14: uniaxially oriented multilayer tape type of laminated and reticulated base material; 15: uniaxially oriented laminated tape type of woven and reticulated base material; 16: hopper; 17: mixing box; 18, 19: pre-fibrillating openers; 20, 21: carding machines; 22, 23: cross-layer forming apparatus; 24: reticulated base material roll; 25, 26: needle punches; 27: reinforcing material for urethane foam molding; 28: winding roll

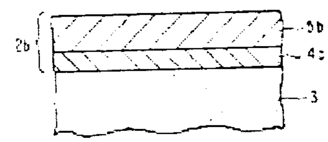
[Fig. 1]



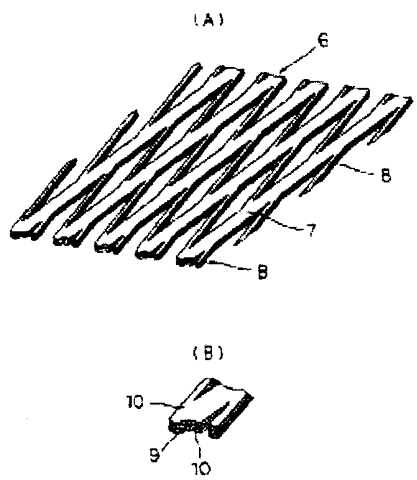
[Fig. 2]



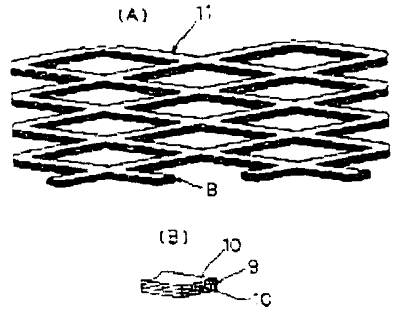
[Fig. 3]



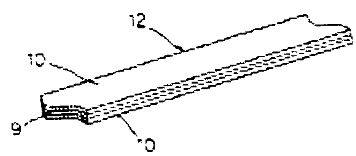
[Fig. 4]



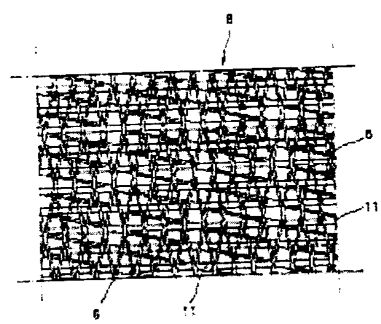
[Fig. 5]



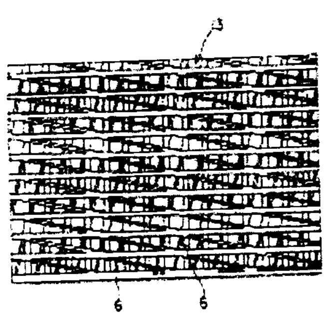
[Fig. 6]



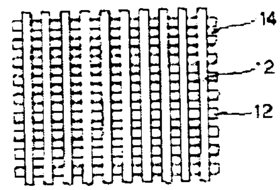
[Fig. 7]



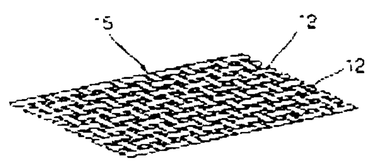
[Fig. 8]



[Fig. 9]



[Fig. 10]



[Fig. 11]